No. 802,485. PATENTED OCT. 24, 1905.

C. W. STIFF & C. L. McKESSON.

RAILWAY SIGNAL SYSTEM.

APPLICATION FILED DEC. 1, 1904.

2 SHEETS—SHEET 1.

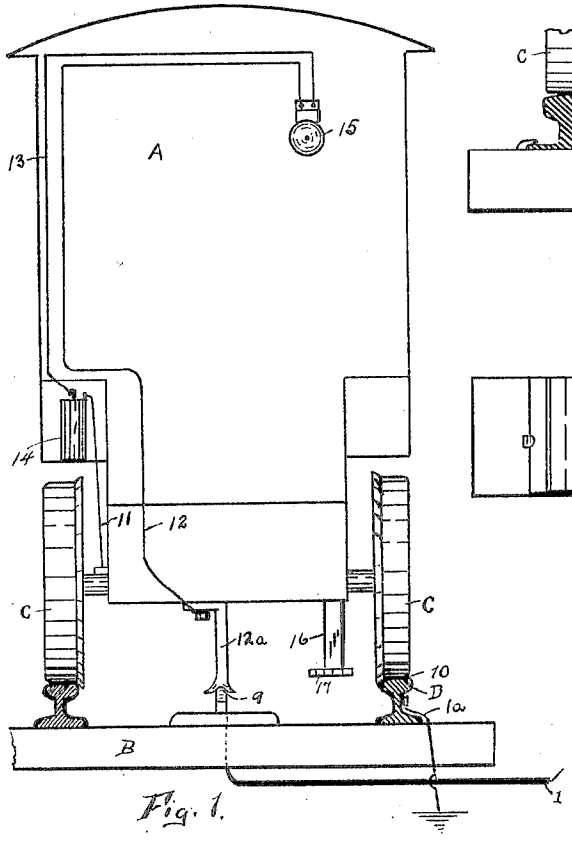

Fig. 1.

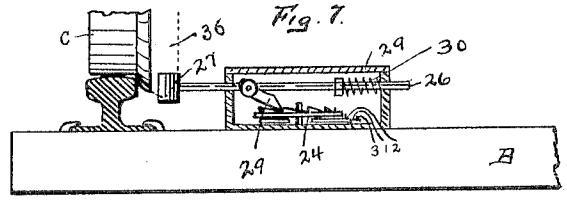

Fig. 7.

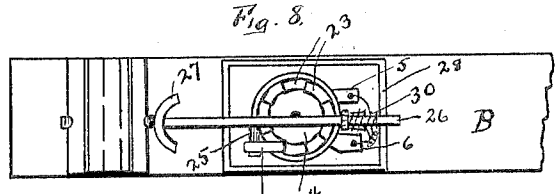

Fig. 8.

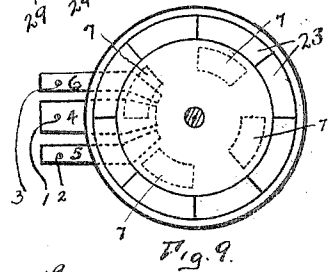

Fig. 9.

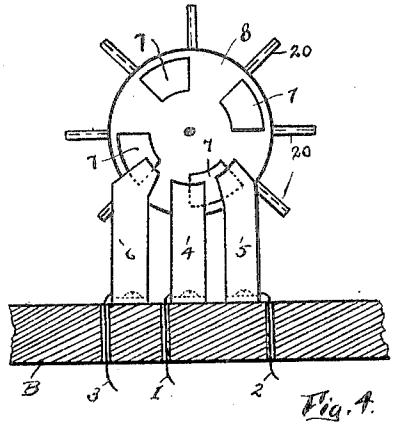

Fig. 2.

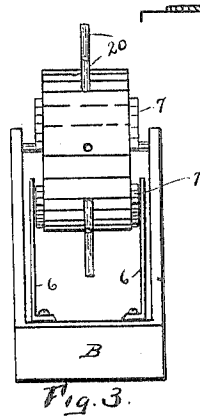

Fig. 3.

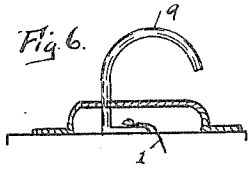

Fig. 6.

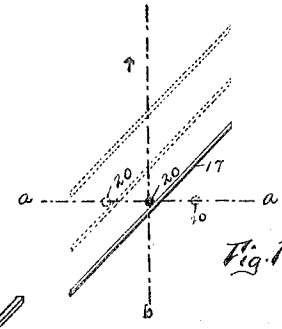

Fig. 10.

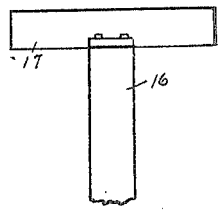

Fig. 4.

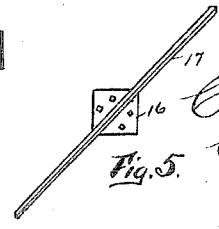

Fig. 5.

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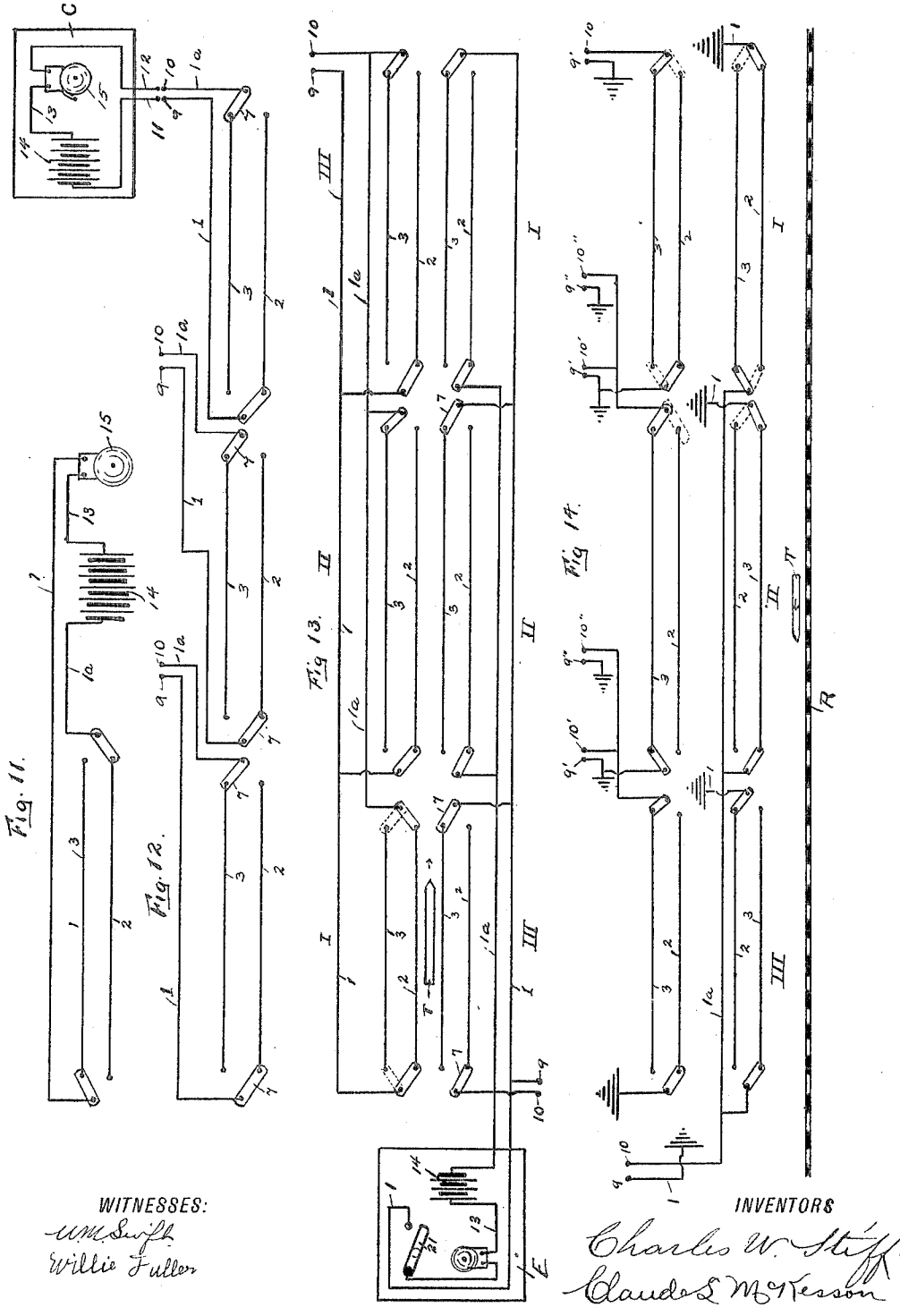

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UNITED STATES PATENT OFFICE.

CHARLES W. STIFF AND CLAUDE L. McKESSON, OF COLORADO SPRINGS, COLORADO.

RAILWAY SIGNAL SYSTEM.

No. 802,485. Specification of Letters Patent. Patented Oct. 24, 1905.

Application filed December 1, 1904. Serial No. 235,030.

To all whom it may concern:

Be it known that we, CHARLES W. STIFF and CLAUDE L. McKESSON, citizens of the United States, residing at Colorado Springs, in the county of El Paso and State of Colorado, have invented a new and useful Railway Signal System, of which the following is a specification.

Our invention relates to an improvement in signal systems in which signals are transmitted to electrical indicators in the engine-cab or by the side of the road whenever danger of rear-end or front-end collisions is imminent. We attain these objects by means of the mechanism and electrical wiring illustrated in the accompanying drawings, in which—

Figure 1 is a rear elevation of an engine-cab, showing the same in a position to receive a signal. Fig. 2 is a side view of an electrical switch suitable for use with this system attached to a railroad-tie. Fig. 3 is a front view of a double switch of the same class. Fig. 4 is a side view of a shifter for operating the switch. Fig. 5 is a plan view of the shifter. Fig. 6 is a view of a contact. Fig. 7 is a side sectional view of another form of electrical switch suitable for use with this system, but operated by an extra flange on a wheel. Fig. 8 is a top plan view of the same switch with the lid removed. Fig. 9 is a plan view of the rotating contact-plate shown in Figs. 7 and 8. Fig. 10 illustrates the manner in which the switch shown in Fig. 2 is operated by the shifter. Fig. 11 is a view of the simplest form of wiring used in this system, such as would be used for a signal at railway-crossings. Fig. 12 illustrates another form of wiring and also shows wiring of an engine-cab. Fig. 13 shows the complete wiring of the road for transmitting signals of warning against head-end collisions. Fig. 14 shows the wiring for trains going one direction only and is exactly half of a complete system of wiring for protection from rear-end and front-end collisions.

Throughout the several views like characters indicate like parts.

Referring to the details of construction as shown, A is an engine-cab.

B is a railway-tie; C C, the wheels of the locomotive; D, a railway-rail; E, a railway-station.

The wiring, as shown in the various figures, contains the wires 2 and 3, each of which is connected at each end with suitable terminals in a three-way switch. From the third pole of the three-way switch the wire 1 leads to a suitable contact or to one pole of an electrical indicator. From the three-way switch connected to the other ends of the wires 2 and 3 the wire 1^a leads to the battery 14. The battery 14 is connected by the wire 13 to the other post of the indicator 15. The various combinations shown consist of individual units or blocks like the one just described with the exception that the wire 1^a is connected with a contact 10 and another wire 11 leads from the contact to the battery. In such cases the wire 1 is also separated and connected with a suitable contact 9, while the wire 12 leads from a corresponding contact to one pole of the electrical indicator.

As shown in use in Fig. 1, the contact 10 exists at a point where the wheel C comes in contact with the rail D, which rail D is electrically connected with the wire 1^a, and in Fig. 1 the wire 1^a is grounded. The contact 9 is a curved metallic rod arranged to touch the contact-post 12^a at the same instant the rail is in contact with the wheel C.

The switch shown in Figs. 2 and 3 consists of a cylinder 8, contact-plates 7, mounted on the end of the cylinder, but separated so that no electrical connection exists between them. Each of these plates consists of exactly one-eighth or one-sixth of a circle, so that the distance between them is equal to the length of them. The contact-terminals 4, 5, and 6, to which are connected the wires 1, 2, and 3, respectively, are so arranged that one of the plates 7 always connects the ends of two of them when the cylinder is left with one of the spokes 20 upright, as shown. Around the circumference of the cylinder are the spokes 20, corresponding in number to the number of spaces and plates on the end of the cylinder. It will be observed that when the cylinder is moved either way, so that the spoke now nearest the top is at the top, that one of the outside terminals will be connected with the center one, either 4 with 5 or 4 with 6. Attached to the under side of the engine is the shifter 17, carried by the support 16. As this passes over the switch this shifter comes in contact with the spoke 20 and the spoke 20 is moved sidewise along the edge of the shifter. In Fig. 10 the broken line *b b* indi-

cates the course of the shifter and the broken line *a a* the direction in which the cylinder with spokes will revolve.

In the electrical switch shown in Figs. 7, 8, 9 the switching is accomplished in a very similar manner. A horizontal revolving plate 24, mounted on a pivot, has on its under side contact-plates 7, each insulated from the other and having a space between them exactly the same length of the plates. The top of this plate has teeth 23 and is virtually a ratchet-wheel operated by the pawl 29, attached by the pinion 25 to the shaft 26. The shaft 26 passes through both sides of the casing 28 and has an actuating-spring 30. On the end of the shaft 26 nearest the rail is a shoe 27, arranged to come in contact with an extra flange on the engine-wheel, as indicated by the dotted line marked 36. The interior of the switch is to be covered with the lid 29. The terminals 4, 5, and 6 are arranged under the plate, so that as the plate revolves one of the terminals (either 5 or 6) will always be connected with the terminal 4.

The object is to provide a system consisting of any desired number of blocks or units each of which will be closed when a train enters upon it, opened as the train leaves it, and the adjacent block or unit closed; also to provide at intervals contacts connected to the various blocks, which contacts will come in contact with suitable terminals on the engine or car, and if the unit is closed an electrical connection will exist between the two contacts and the block or unit be virtually a conductive electrical loop. When this loop, if complete, is brought into contact with the contact-terminals on the engine, the indicator will give a signal. If no train is on the block, the last train which left it left the circuit broken at one of the switches, and as the circuit is incomplete no signal would be given. It will be seen that only the blocks or units occupied by the engines will be closed and all others open.

Each unit in the case of rear-end signals should be provided with individual contacts or signals so arranged that a second engine following, upon approaching the block then occupied by the first engine, will receive a signal through the contacts connected with such block occupied by the first engine, thereby apprising such second engine of the fact that it is in close proximity to another engine in front of it bound in the same direction. In the case of rear-end signals the engine in the lead does not receive notice that another engine is following it; but the engine in the rear cannot run into the engine or train ahead without receiving warning. As to front-end signals for the prevention of head-end collisions, the same system is used, but somewhat differently applied. Instead of the wires connected with any given block leading to the rear of such block and being connected with contacts so arranged as to give signals to engines following such wires lead from the unit so occupied by the engine to the front any required distance to a point where contacts are so placed that they will transmit signals to trains approaching the first train from the front only. Separate sets of wiring, separate switches, and separate contacts are always provided for the trains moving in the opposite directions. The units for both front and rear end signals are to be of such a length that only one train shall occupy any unit at one time, and therefore it will be necessary where stations and railway-switches are any considerable distance apart to place two or more units between such stations or switches. Where separate tracks are used for trains moving in the different directions, it is obvious that only rear-end signals need be given; but where a single track is used for trains moving in both directions both front and rear protection should be afforded. As front-end collisions generally prove more disastrous and frequent than rear-end collisions, front-end signals may be used exclusively. Where on a single track front-end signals alone are used or where front-end signals are used with rear-end signals, the units which afford such front-end protection may be connected to common conductors leading to contacts or signals in front of all of such units so connected. For illustration, reference may be had to Fig. 13, where two stations are separated by a single track which is divided into three units with two sets of wiring for front-end protection of trains moving in either direction. There are therefore six units altogether in the two separate sets of wiring. The three units for the use of the train moving in the direction indicated by the arrow are numbered I, II, and III, from left to right. The other three are likewise numbered from right to left. All of the first three units are connected with the common conductors 1 and 1^a, and thereby connected with the contacts 9 and 10, placed at the extreme right of the figure. These contacts are so arranged that they come into contact with and transmit signals to trains approaching from the right only. If any of the said units I, II, or III are closed, (the unit I being closed, as shown,) an engine upon leaving the station at the right of the figure and bound for the station at the left will be warned that the track is already occupied by a second engine coming in that direction, and there being no passing-point between it will not leave such station or stopping-place until the train approaching from the left arrives and passes it. Then should no other be following the train marked T the train at the right-hand station may start toward the left. When this last train starts toward the left, no train can then enter the track from the left without receiving through the signals 9 and 10 at the left end warning of the approach of the train from the right. It will thus be seen that in

a front-end system the units operated by a train going in any given direction transmit signals to trains approaching from the opposite direction, and in rear-end signals the unit operated by the train transmits to the first train following such signals as are to be given.

In Fig. 11 the unit is shown with the circuit open. Should an engine enter upon this unit from either end, the switch on the end at which it entered would be closed and the bell would ring. If it entered from the end farthest from the bell, the wire 2 would become connected with the wire 1 instead of being disconnected, as shown. The wire 3 would then be disconnected at both ends. When the same train passed off of the unit, if at the end nearest the bell, then the switch would disconnect wire 2 from the wire 1^a and connect it with the wire 3, leaving the circuit open; but if such train backed off the unit the switch at the end where it entered would be restored to the position from which it was moved when the train entered and the circuit left open. In this way it will be observed that any number of trains may pass over the circuit one after another and each will close the circuit while upon it, but open it when it leaves. By arranging these units in succession, each one being independent of all the others, a train passing along the track will always occupy a closed unit. These units will give a signal in advance, as where the train enters at the end farthest from the bell, or to the rear, as would be the case if the train entered at the end nearest the bell.

In Fig. 12 the bell-circuit is separated from the units and placed in the engine with contacts, as shown. There are three of the individual units, each with its separate contacts. If the units and switches in this figure are so arranged as to be operated by trains moving to the right and the contacts so arranged as to come in contact with engines moving to the left, then this system as shown would be what we term a "front-end" signal system. If the switches are operated by trains moving to the left and the contacts are so placed as to transmit signals to trains moving toward the left, then it would be what we term a "rear-end" signal system.

In Fig. 13, T indicates a train traveling in the direction indicated by the arrow. The dotted lines at the end at which the train entered show the change in connections occasioned by reason of the train moving the switch. At one end of Fig. 13 is shown a circuit in an inclosure representing a railway-station. It consists of a switch, a battery, and a bell. If the station agent desires to ascertain if the track is clear of trains approaching from the right before allowing a train to leave going toward the right, he may simply press the switch, and if all the units are open no signal will be given; but if a train is approaching the station some unit will be closed and a signal will be given. The plan of wiring as shown here relates only to head-end signals.

In Fig. 14 a system of wiring is shown for protection against front-end and rear-end collisions. There are two separate sets of wiring and separate switches for each or double switches, as shown in Fig. 3, all operated by trains moving in the direction shown by arrow. The front-end signals are given at the contacts 9 and 10, the trains approaching from left. The rear-end signals are given trains following at the contacts 9′ and 10′ and 9″ and 10″ placed at intervals. For economy some of the wires are grounded. In Fig. 4, T indicates a train running in the direction indicated by the arrow-head. The dotted lines in units I and II show the changes made in the connections by this train as it passed along the track R. In the position now shown a train coming toward this one would receive a signal of danger at the contacts 9 and 10 at the left end of the figure. A train following it would be warned at 9″ and 10″ and 9′ and 10′ that this train was on the unit ahead. Where both front and rear end signals are to be received it would be doubtless desirable to provide two separate sets of engine-circuits, so that front-end and rear-end signals would be exhibited on different indicators. It would be necessary in that case to duplicate the engine-wiring and arrange the contact-shoe for each so it would not come in contact with the contacts for the other set of signals. This system, as shown in Fig. 14, is obviously just one-half of a complete system, all switches here shown being for trains moving in the direction of the train T. A duplicate set of wiring and switches, reversed as to direction, would be required for trains moving in the opposite direction.

Any three-way switch which can be operated by an engine may be used, and we do not desire to be limited to the exact construction shown in the two kinds shown. The indicator or bell may consist of any ordinary indicator or bell now used in such work.

What we claim as new, and desire to secure by Letters Patent, is—

1. In a railway signal system the combination of a battery, a suitable conductor leading from one pole of the battery to one connecting-post on a suitable indicator, a suitable indicator, a conductor leading from the other connecting-post on an electrical indicator to a suitable contact, a suitable contact arranged to come in contact with a stationary contact and form a temporary electrical connection, a conductor leading from the remaining pole of the battery to a second contact which is arranged to come in contact with a second permanent contact and form electrical connection at the same time the first two contacts are in electrical connection, a conductor leading from each of the permanent contacts

to two separate electrical three-way switches; two suitable three-way switches, two conductors connecting the two remaining poles of the three-way switches, all substantially as described and for the uses and purposes set forth.

2. In an electrical railway signal system the combination of an engine-circuit consisting of a battery, one pole of which is connected with one connecting-post of a suitable electrical indicator, the other pole to a suitable contact on the engine, and having a conductor leading from the other post of the indicator to another contact on the engine, and a stationary metallic loop consisting of two contacts arranged to form electrical connection with the two electrical contacts on the engine, a conductor leading from one of the stationary contacts to a suitable three-way switch located at one end of a block of track, two conductors connecting the remaining connecting-posts with corresponding connecting-posts in a similar three-way switch at the other end of the block, a conductor leading from the remaining connecting-post in the second three-way switch to the other stationary contact-post, and two three-way electrical switches so constructed that each of the conductors leading to the stationary contacts will always be in electrical connection with one of the conductors connecting the two switches.

3. The combination in a three-way switch of one inside terminal and two outside terminals, a rotating plate having on its surface next to the terminals suitable contacts, contacts mounted on the rotating plate electrically insulated from each other and so arranged that they will always connect one of the outside terminals with the center terminal, suitable apparatus for rotating the plate.

4. The combination in a three-way switch of the inside terminal 4, the outside terminals 5 and 6, a rotating plate 24 mounted over the ends of the terminals, the contact-plates 7 mounted at regular intervals on the side of the plate 24 next the terminals and so arranged that one of such plates will always connect one of the outside terminals 5 and 6 with the inside terminal 4, a pawl-and-ratchet device 23 and 29 for rotating the plate, a shaft 26 for carrying the pawl, suitable means for returning the shaft to its place after use, and a suitable apparatus on a railway-engine for actuating such shaft.

5. In a railway signal system the combination of an electrical battery mounted on an engine, a conductor leading from the battery to the electrical indicator situated in the engine-cab, a conductor leading from the other connecting-post of the indicator to a contact-shoe on the under side of the engine, a contact permanently arranged on the railway in such a position that the contact-shoe on the engine will brush it and form an electrical connection in passing, a conductor leading from the said contact to a suitable three-way switch, a suitable three-way switch having two outside terminals and one inside terminal with plates for forming a connection between them and so arranged that one of the outside terminals will always be in electrical connection with center one, two conductors leading from the outside terminals to outside terminals in another like switch at another point on the railway-track, a second three-way switch, a conductor connecting the middle terminal of the second switch with the railway-rail opposite the said permanent contact, suitable apparatus on the engine for operating such switches when the engine passes over them, a conductor connecting the wheels and running-gear of the engine with the other pole of the said battery, all substantially as described and for the uses and purposes set forth.

In testimony whereof we have hereunto affixed our signatures in the presence of two subscribing witnesses.

CHARLES W. STIFF.
CLAUDE L. McKESSON.

Witnesses:
W. M. SWIFT,
J. S. MYERS.